

What is claimed is:

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1. A catheter comprising:
- a. a closed-ended fluid conduit, said fluid conduit comprising:
 - i. a flexible catheter tube having a proximal end, a distal end, and a lumen extending therebetween defined by a smoothly continuous inner surface of the outer wall of said catheter tube; and
 - ii. a terminal endwall continuously supported by said outer wall of said catheter tube at said distal end thereof; and
 - b. a slit extending through said terminal endwall.
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2. A catheter as recited in Claim 1, wherein said slit intersects the longitudinal axis of said catheter tube at said distal end thereof.
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3. A catheter as recited in Claim 1, wherein the intersection of said terminal endwall with said outer wall of said catheter tube defines a plane of said terminal endwall, and said plane of said terminal endwall is perpendicular to the longitudinal axis of said catheter tube at said distal end thereof.
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4. A catheter as recited in Claim 3, wherein said terminal endwall is planar.
5. A catheter as recited in Claim 3, wherein said terminal endwall is convex.

6. A catheter as recited in Claim 1, wherein the configuration of the transverse cross section of the exterior of said outer wall of said catheter tube at said distal end thereof is circular.

5 7. A catheter as recited in Claim 1, wherein said slit extends through said outer wall of said catheter tube adjacent said terminal endwall.

10 8. A catheter as recited in Claim 1, wherein the thickness of said outer wall of said catheter tube adjacent said terminal endwall is less than the thickness of said outer wall of said catheter tube proximal thereof.

15 9. A catheter as recited in Claim 1, wherein said terminal endwall is inclined relative to the longitudinal axis of said distal end of said catheter tube.

10. A catheter as recited in Claim 1, wherein the thickness of said terminal endwall is uniform.

20 11. A catheter as recited in Claim 1, wherein the thickness of said terminal endwall is nonuniform.

12. A catheter as recited in Claim 12, wherein the thickness of said terminal endwall varies circularly symmetrically about an origin located interior of the periphery of said terminal endwall.

5 13. A catheter as recited in Claim 1, wherein the area of said lumen in a transverse cross section of said catheter tube at said terminal endwall is greater than the area of said lumen in a transverse cross section of said catheter tube remote from said terminal endwall.

10 14. A catheter as recited in Claim 1, wherein said outer wall of said catheter tube adjacent said terminal endwall is thinner than said outer wall of said catheter tube proximal thereof.

15 15. A catheter as recited in Claim 1, wherein the thickness of said terminal endwall is less than the thickness of said outer wall of said catheter tube.

16. A catheter comprising:

a. a flexible catheter tube having a proximal end, an open distal end, and a lumen extending therebetween, said lumen being defined by an inner surface of the outer wall of said catheter tube;

b. a hollow distal extension for said catheter tube attached to said distal end thereof, said distal extension comprising:

i. an outer wall;

ii. a fluid passageway defined by an inner surface of said outer wall of said distal extension;

iii. a terminal endwall continuously supported by said outer wall of said distal extension at the end thereof remote from said catheter tube;

iv. a proximal end secured to said distal end of said catheter tube, the configuration of the transverse cross section of said fluid passageway of said distal extension at said proximal end thereof being substantially the same as the configuration of the transverse cross section of said lumen of said catheter tube at said distal end thereof, said inner surface of said outer wall of said distal extension at said proximal end thereof being smoothly continuous with said inner surface of said outer wall of said catheter tube at said distal end thereof; and

c. a slit extending through said terminal endwall of said distal extension.

17. A catheter as recited in Claim 16, wherein the configuration of the transverse cross section of the exterior of said distal extension at said proximal end thereof is substantially the same as the configuration of the transverse cross section of the exterior of said catheter tube at said distal end thereof, the outer surface of said catheter tube at said distal end thereof being smoothly continuous with the outer surface of said distal extension at said proximal end thereof.

18. A catheter as recited in Claim 16, wherein the intersection of the periphery of said terminal endwall with said outer wall of said distal extension defines a plane of said terminal endwall, and said plane of said terminal endwall forms an acute orientation angle with the longitudinal axis of said distal extension at said end thereof remote from said catheter tube.

19. A catheter comprising:

a. a flexible catheter tube having a proximal end, an open distal end, and a lumen extending therebetween, said lumen being defined by an inner surface of the outer wall of said catheter tube;

b. a hollow distal extension for said catheter tube attached to said distal end thereof, said distal extension comprising:

i. an outer wall;

ii. a fluid passageway defined by an inner surface of said outer wall of said distal extension; and

iii. a proximal end secured to said distal end of said catheter tube, the configuration of the transverse cross section of said fluid passageway of said distal extension at said proximal end thereof being substantially the same as the configuration of the transverse cross section of said lumen of said catheter tube at said distal end thereof, said inner surface of said outer wall of said catheter tube at said distal end thereof being smoothly continuous with said inner surface of said outer wall of said distal extension at said proximal end thereof;

c. selectively operable fluid transport means:

i. for closing the end of said fluid passageway remote from said catheter tube;

ii. for infusing a fluid from said fluid passageway of said distal extension into the exterior of said distal extension in a direction generally

aligned with the longitudinal axis of said distal extension at said distal end thereof, when a predetermined positive pressure differential exists between said fluid passageway of said distal extension and the exterior of said distal extension; and

5 iii. for aspirating a fluid from the exterior of said distal extension into said fluid passageway of said distal extension, when a predetermined negative pressure differential exists between said fluid passageway of said distal extension and the exterior of said distal extension.

10 20. A catheter as recited in Claim 19, wherein said transport means comprises:

- 15 a. a terminal endwall continuously supported by said outer wall of said distal extension at the end thereof remote from said catheter tube; and
- b. a slit extending through said terminal endwall.

21. A catheter comprising:

a. a closed-ended fluid conduit, said fluid conduit comprising:

i. a flexible catheter tube having a proximal end, a distal end, and an outer wall extending therebetween, said outer wall of said catheter tube having a smoothly continuous outer surface and a smoothly continuous inner surface defining a longitudinally extending fluid flow lumen between said proximal end and said distal end of said catheter tube;

ii. a terminal endwall continuously supported by said outer wall of said catheter tube at said distal end thereof; and

b. a selectively operable stagnation suppression means for effecting fluid flow through a region of said lumen immediately adjacent said terminal endwall in response to predetermined positive and negative pressure differentials between said lumen and the exterior of said fluid conduit.

22. A catheter as recited in Claim 21, wherein said selectively operable stagnation suppression means comprises a slit extending through said terminal endwall.

23. A catheter comprising:

a. a flexible catheter tube having a proximal end, an open distal end, and a lumen extending therebetween, said lumen being defined by an inner surface of the outer wall of said catheter tube;

b. a hollow distal extension for said catheter tube attached to said distal end thereof, said distal extension comprising:

i. an outer wall;

ii. a fluid passageway defined by an inner surface of said outer wall of said distal extension;

iii. an arcuate terminal endwall continuously supported by said outer wall of said hollow distal extension at the end thereof remote from said catheter tube;

iv. a proximal end secured to said distal end of said catheter tube, the configuration of the transverse cross section of said fluid passageway of said distal extension at said proximal end thereof being substantially the same as the configuration of the transverse cross section of said lumen of said catheter tube at said distal end thereof, said inner surface of said outer wall of said catheter tube at said distal end thereof being smoothly continuous with said inner surface of said outer wall of said hollow distal extension at said proximal end thereof; and

c. a selectively operable two-way, three-position valve in said terminal endwall.

24. A catheter as recited in Claim 23, wherein said valve comprises a slit extending through said terminal endwall.

5 25. A catheter as recited in Claim 23, wherein said valve comprises a pair of intersecting slits extending through said terminal endwall.

10 26. A catheter as recited in Claim 23, wherein the interior surface of said outer wall of said distal extension at said terminal endwall is disposed closer to the outer surface of said outer wall of said distal extension than portions of said inner surface of said outer wall of said distal extension proximal of said terminal endwall.

27. A catheter comprising:

a. a multiple lumen closed-ended fluid conduit, said fluid conduit comprising:

i. a flexible catheter tube, said catheter tube comprising:

A. a proximal end;

B. a distal end;

C. an outer wall extending from said proximal end to said distal end of said catheter tube;

D. an internal septum extending between nonadjacent first and second locations on the inner surface of said outer wall of said catheter tube from said proximal end to said distal end thereof;

E. a first lumen defined by a first side of said septum and the portion of said inner surface of said outer wall of said catheter tube adjacent to said first side of said septum; and

F. a second lumen on the side of said septum opposite from said first lumen;

ii. a terminal endwall continuously supported at said distal end of said catheter tube by the combination of said septum and the portion of said outer wall of said catheter tube adjacent said first lumen; and

b. a slit extending through said terminal endwall.

28. A catheter as recited in Claim 27, wherein said slit is oriented parallel to said septum.

29. A catheter as recited in Claim 27, wherein said slit is oriented perpendicular to said septum.

30. A catheter as recited in Claim 27, wherein said slit is oriented at an acute angle to said septum.

31. A catheter as recited in Claim 27, wherein said catheter tube further comprises a third lumen extending between said proximal end and said distal end of said catheter tube.

32. A catheter comprising:

a. a flexible catheter tube having a proximal end, an open distal end, and a first lumen and a second lumen extending therebetween on opposite sides of an internal septum;

b. a hollow distal extension for said catheter tube attached to said distal end thereof, said distal extension comprising:

i. an outer wall;

ii. an interior wall extending between distinct nonadjacent locations on the inner surface of said outer wall;

iii. a first fluid passageway defined by a first side of said interior wall and the portion of said inner surface of said outer wall adjacent to said first side of said interior wall;

iv. a second fluid passageway on the side of said interior wall opposite from said first fluid passageway;

v. a terminal endwall continuously supported at the end of said distal extension remote from said catheter tube by the combination of said interior wall of said distal extension and the portion of said outer wall of said distal extension adjacent to said first fluid passageway; and

vi. a proximal end secured to said distal end of said catheter tube, the configuration of the transverse cross section of said first fluid passageway of said distal extension at said proximal end thereof being substantially the same as the configuration of the transverse cross section of said first lumen of

33. A catheter comprising:

a. a flexible catheter tube having a proximal end, an open distal end, and a first lumen and a second lumen extending therebetween on opposite sides of an internal septum;

b. a hollow distal extension for said catheter tube attached to said distal end thereof, said distal extension comprising:

i. an outer wall;

ii. an interior wall extending between distinct nonadjacent locations on the inner surface of said outer wall;

iii. a first fluid passageway defined by a first side of said interior wall and the portion of said inner surface of said outer wall adjacent thereto, the configuration of the transverse cross section of said first fluid passageway of said distal extension at the proximal end thereof being substantially the same as the configuration of the transverse cross section of said first lumen of said catheter tube at said distal end thereof, the wall of said first lumen of said catheter tube at said distal end thereof being smoothly continuous with the wall of said first fluid passageway of said distal extension at said proximal end thereof;

iv. a first terminal endwall continuously supported at the end of said distal extension remote from said catheter tube by the combination of said interior wall of said distal extension and the portion of said inner surface of said outer wall of said distal extension adjacent to said first fluid passageway;

v. a second fluid passageway on the opposite side of said interior wall from said first fluid passageway defined by a second side of said interior wall opposite from said first side thereof and the portion of said inner surface of said outer wall adjacent thereto, the configuration of the transverse cross section of said second fluid passageway of said distal extension at said proximal end thereof being substantially the same as the configuration of the transverse cross section of said second lumen of said catheter tube at said distal end thereof, the wall of said second lumen of said catheter tube at said distal end thereof being smoothly continuous with the wall of said second fluid passageway of said distal extension at said proximal end thereof; and

vi. a second terminal endwall continuously supported at the end of said distal extension remote from said catheter tube by the combination of said interior wall of said distal extension and the portion of said inner surface of said outer wall of said distal extension adjacent to said second fluid passageway;

c. a first slit extending through said first terminal endwall; and

d. a second slit extending through said second terminal endwall.

34. A catheter as recited in Claim 33, wherein said first terminal endwall and said second terminal endwall intersect at the end of said interior wall of said distal extension remote from said catheter tube, and the intersection of said first terminal endwall and said second terminal endwall is perpendicular to the longitudinal axis of said distal extension at said end thereof remote from said catheter tube.

35. A catheter as recited in Claim 33, wherein:

a. the intersection of said first terminal endwall with said portion of said inner surface of said outer wall of said distal extension adjacent to said first fluid passageway and the intersection of said second terminal endwall with said portion of said inner surface of said outer wall of said distal extension adjacent to said second fluid passageway are coplanar, together defining a common plane of said first and second terminal endwalls;

b. the intersection of said common plane of said first and second terminal endwalls with said interior wall of said distal extension is perpendicular to the longitudinal axis of said distal extension at said end thereof remote from said catheter tube; and

c. said common plane of said first and second terminal endwalls forms unequal supplemental dihedral orientation angles with said interior wall of said distal extension.

d in Claim 33, wherein the intersection of said first
d distal extension is longitudinally offset along said
the intersection of said second terminal endwall w
n.

d in Claim 36, wherein the intersection of said first
said distal extension is parallel to the intersection
interior wall of said distal extension.

d in Claim 33, wherein the intersection of said first
d distal extension is longitudinally offset along said
the intersection of said second terminal endwall w
n.

d in Claim 36, wherein the intersection of said first
said distal extension is parallel to the intersection
interior wall of said distal extension.

38. A catheter as recited in Claim 37, wherein:

a. the intersection of said first terminal endwall with said portion of said inner surface of said outer wall of said distal extension adjacent to said first fluid passageway defines a plane of said first terminal endwall, said plane of said first terminal endwall and said interior wall of said distal extension forming a dihedral first terminal endwall orientation angle;

b. the intersection of said second terminal endwall with said portion of said inner surface of said outer wall of said distal extension adjacent to said second fluid passageway defines a plane of said second terminal endwall, said plane of said second terminal endwall and said interior wall of said distal extension forming a dihedral second terminal endwall orientation angle, said dihedral second terminal endwall orientation angle being equal in size to said dihedral first terminal endwall orientation angle.

39. A catheter as recited in Claim 37, wherein:

a. the intersection of said first terminal endwall with said portion of said inner surface of said outer wall of said distal extension adjacent to said first fluid passageway defines a plane of said first terminal endwall, said plane of said first terminal endwall and said interior wall of said distal extension forming a dihedral first terminal endwall orientation angle; and

b. the intersection of said second terminal endwall with said portion of said inner surface of said outer wall of said distal extension adjacent to said second fluid passageway defines a plane of said second terminal endwall, said plane of said second terminal endwall and said interior wall of said distal extension forming a dihedral second terminal endwall orientation angle, said dihedral second terminal endwall orientation angle being unequal in size to said dihedral second terminal endwall orientation angle.

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